

IN the same journal M. de la Source describes his experiments on the dialysis of ferric oxide dissolved in a solution of ferric chloride. "Fer Bravais" of medicine consists of $30\text{Fe}_2\text{O}_3 \cdot \text{Fe}_2\text{Cl}_6$; after three months' dialysis of a dilute solution of this substance the greater part of the chlorine had passed into the dialysate, the proportion of ferric oxide to chloride was then $116\text{Fe}_2\text{O}_3 \cdot \text{Fe}_2\text{Cl}_6$, and the chlorine yet continued to pass through the dialyser. The author thinks that ferric hydrate is, *per se*, under certain conditions soluble in water.

HERR A. HERZEN describes in *Bied. Centralblatt* some experiments on acetous fermentation. In each of three flasks was placed 100 c.c. pure water: to the first flask 10 per cent. pure alcohol and a drop from the surface of a fermenting wine full of *Mycoderma aceti* were added; to the second flask were added 5 per cent. of pure acetic acid and a drop of the fermenting wine; and to the third flask were added 5 per cent. acetic acid, 5 per cent. of a saturated solution of boric acid, and a drop of the fermenting wine. After eight days at 25° no *Mycoderma* appeared in the first flask, much appeared in the second, and a little in the third. Hence the author concludes that *Mycoderma aceti* lives at the expense of acetic acid already formed in wine, and that it does not cause the transformation of alcohol into acetic acid, but that it is rather a consequence of this chemical change; further, that boric acid retards the development of *Mycoderma*, but does not prevent it in presence of already-formed acetic acid.

IN *Dingler's Polytech. Journal* a paper appears by Drs. Lunge and Schäppi, on bleaching-powder. The results confirm the now generally accepted formula first proposed by Odling, viz., CaOCl_2 .

It was shown some time ago by H. T. Brown that alcoholic fermentation proceeds more slowly under diminished than under ordinary pressure. According to Boussingault (*Compt. rend.*), however, sugar is rapidly transformed into alcohol by the action of yeast, if the carbon dioxide and alcohol, as these are produced, be rapidly removed from the fermenting liquid. Addition of alcohol soon stops fermentation under ordinary circumstances; Boussingault shows that if the vessel containing the fermenting liquid be connected with an air-pump which is worked energetically, fermentation proceeds rapidly even when a considerable amount of alcohol has been added to the liquid.

IN connection with the recent liquefaction of ozone by Hautefeuille and Chappuis, the following numbers, from a paper by the same authors in *Compt. rend.*, are of interest, as showing the exact influence of temperature and pressure on the ozonising of oxygen. Diminution of pressure does not tend to increase the amount of ozone produced, but decreased temperature exerts a marked action in increasing the amount of oxygen transformed into ozone:—

Tension of oxygen.	Tension of ozone.				Proportion of ozone by weight.			
	-23°	0°	20°	100°	-23°	0°	20°	100°
760	108.70	82.84	53.96	—	0.214	0.149	0.106	—
380	51.68	38.76	31.54	1.48	0.204	0.152	0.125	0.0117
300	40.20	30.60	22.20	—	0.201	0.1525	0.112	—
225	24.80	22.95	15.52	0.088	0.191	0.153	0.104	0.0118
180	22.30	16.58	10.52	—	0.181	0.137	0.089	—

A. DITTE describes in *Compt. rend.* a number of new fluorine compounds of uranium; the most important are $\text{UF}_6 \cdot 8\text{HF}$ and UO_2F_2 , produced by the action of hydrofluoric acid on the oxide U_3O_8 ; when the former compound is heated in a closed platinum dish it melts, gives off hydrofluoric acid and small quantities of the oxyfluoride UOF_4 , which compound is produced in larger quantity by heating the above-mentioned oxyfluoride, UO_2F_2 , in a closed vessel. The hexfluoride UF_6 is produced by heating the double salt $\text{UF}_6 \cdot 8\text{HF}$ in an open crucible. Various double salts are also described, the general formula being $\text{UO}_2\text{F}_2 \cdot 4\text{MF}$, where M may be K, Na, Li, Rb, or Tl.

CLEVE has made a redetermination of the atomic weight of the very rare metal erbium (*Compt. rend.*). Assuming the formula of the oxide to be Er_2O_3 , the atomic weight of the metal is 166. Pure erbia, Er_2O_3 , is a beautiful rose-coloured earth, slowly soluble in acids, having a specific gravity of 8.64, and forming salts characterised by a deep-red colour; several of these salts are described by Cleve.

THE same author has succeeded in separating nearly pure *thulium*; this metal and its salts are colourless, but solutions of the salts show two absorption bands, one strongly marked in the

red, and one broad band in the blue. The atomic weight of thulium is 129.6 or 170.7, according as the metal is regarded as di- or tri-valent.

PHYSICAL NOTES

It is stated that amongst the recent discoveries of Prof. Bell in connection with the photophone research is the interesting fact that melted sulphur conducts electrically like selenium, but only at temperatures below that at which it thickens and becomes dark and viscid.

THE *Comptes rendus* for November 2 informs us that Prof. Graham Bell and M. Janssen have attempted to hear with the photophone the sounds believed to accompany the rapid commotions taking place in the solar photosphere. The experiments were made at the Observatory of Meudon, a selenium cylinder being placed in different parts of an image of the sun some two feet in diameter. No very conclusive results were obtained, but M. Janssen has further suggested that a sort of concentrated effect might be obtained by passing a number of successive photographs of a sun-spot across a beam of light, the variations of the intensity of the beam producing sounds when they fall upon the sensitive "photophonic pile" of selenium. Some experiments in furtherance of this suggestion are now proceeding.

HAVING undertaken a series of researches upon the rapidity of evaporation of liquids, in dependence from the cohesion of molecules on their surfaces, M. Sreznovsky has measured how this rapidity varies with the variations of the height of the meniscus. He has established that, the diameter of the meniscus remaining invariable, the rapidity of evaporation increases as the height of the meniscus diminishes, that is, as its radius increases. There is however an anomaly as to this last law for distilled water: when the evaporation is measured in a meniscus the height of which is greater than the radius of its basis, the rapidity of evaporation increases throughout, however the radius of the meniscus begins by diminishing, and increases only after having passed through a minimum, but this minimum does not have a corresponding minimum in the rapidity of evaporation.

AT the recent meeting of the Helvetic Society of Natural Sciences M. Forel described a *thermal bar* which is developed in winter parallel to the shore of a lake of fresh water, and which separates the pelagic from the littoral region. The water of the former region remains long, and in some lakes always, at a temperature above 4°C ; in the littoral region, if the winter be cold, the temperature descends between 4° and zero; and between the two there is a band of water at 4° , descending to the bottom—a kind of mountain with crest parallel to the shore and a talus on either side.

M. DUFOUR described at the same meeting an apparatus for indicating the variations of chemical intensity of the sunlight. It has some likeness to Draper's titonometer; the principle is, opposing the variable action of light on a mixture of chlorine and hydrogen, with an electric current (of variable intensity, and measurable each instant), which by its passage causes decomposition of a quantity of hydrochloric acid equal to that produced by action of the light on the mixture of chlorine and hydrogen. The apparatus is like a Rumford differential thermometer; in one bulb is some hydrochloric acid solution, with carbon electrodes, in the other some sulphuric acid. The light acts on the former. One mode of measurement is to note the time taken in displacement of the sulphuric acid column a certain distance along the connecting tube. Then bring back the column to its original position by passing the current.

M. PICTET has lately made experiments (*Arch. de Sci.*) as to the dissolving power of gases and vapours on one another. Various solutions of alcohol and water were successively put into one of two glass balloons connected by a tube; pressure was diminished with an air-pump, so that the space became filled with vapours from the mixture. By closing the tapered point of the second balloon with the blowpipe, the apparatus allowed of distillation being effected with small differences of temperature. Plunging successively the balloon that held the solution in water at from 0° to 80° , and the other in water only 1° or a fraction of a degree below that of the liquid, M. Pictet got condensed products, the quality of which indicated what "affinity of solution" existed between water and alcohol. The following conclusions were arrived at: The weight of condensed liquid is proportional, in unit time, to

the difference of temperature between the liquid in ebullition and the condensed liquid. The weight of liquid condensed in unit time is independent of the interior pressure or of the mean temperature during distillation. Analysis shows that the gases have no power of solution on one another. M. Pictet was thus led to an industrial process for rectification of spirits.

GEOGRAPHICAL NOTES

At the meeting of the Geographical Society on Monday, Sir Bartle Frere read what may best be described as a suggestive paper on Temperate South Africa as a route to the Central Equatorial Region. After defining the temperate region as the vast tract of country extending to Cape Frio on the Atlantic coast and to the mouth of the River Tugela on the opposite side of the continent, and giving a brief account of its geography, &c., Sir Bartle addressed himself chiefly to the task of pointing out how it could be made available as a base of operations in exploring the country north of the Zambesi, and suggesting agencies which might be turned to account for the extension of geographical knowledge. These agencies are the traders and hunters, who have a wide acquaintance with many regions otherwise unknown, and missionaries of various denominations. The latter have no less than eighty-four fixed stations beyond the colonial boundaries, manned by 812 Europeans, many of whom are highly-cultivated and intelligent men, and have great opportunities for acquiring geographical information. Sir Bartle Frere also hoped that the Council of the Society might see their way to urging the Government to undertake a proper survey of the coast-line, as well as of the interior of the five colonies.

At the meeting of the Berlin Geographical Society on November 6 the safe arrival of Dr. Lenz at Timbuctoo (by a route not before taken by any European) was announced. Two of his followers were lost in the desert, and two had gone back. Dr. Stecker (who lately went to Massowah with Herr Rohlf's) will, according to circumstances, either push through the Galla regions or to the East coast, or to the Great Lakes. Major v. Mechow reached a town on the Quanza, in the territory of the Holo, about 200 km. from Malange on July 19, after great difficulties, especially in carriage of the boat. The natives were friendly throughout. A little above the place reached are the two last falls of the Quanza, between which is the mouth of the Cambo. The Major seems to have been the first white to visit these waterfalls. He was going to Löpfung with a view to determine the course of the Quanza. Dr. Pogge and Lieut. Wissmann were also travelling in that region the same month, intending to reach Musumba, the residence of the Muata Jambo; Dr. Pogge's object is to establish stations in the interior. Lieut. Wissmann will make journeys for topographical and collecting purposes. The Italian traveller, Dr. Matteucci, is seeking to reach Bornu from South Dar-Fur, going round Wadai and Bagirmi. *Inter alia* the Society resolved to memorialise the German Government to take part in the international project of systematic Polar investigation.

At the sitting of November 19 of the Société de Géographie of Paris M. Zweifel received the palm of Officer of the Academy as a reward for the discovery of the sources of the Niger, in company with M. Marius Moustier. The laureate declining to speak himself, an address was delivered on behalf of him and his companions by Dr. Harmand, the well-known explorer of Cochin China. It appears that MM. Zweifel and Moustier saw a granite rock from which the powerful stream takes its rise; but they were not admitted to the site, owing to the high priest of Tembi Saleh, who inhabits an island situated on a small lake formed by the stream at a very few miles from its source. So something more remains to be done to complete the work begun by Laing, Reade, and Blyden.

SIR ALLEN YOUNG leaves England next month in his yacht, and will visit, among other places, the Canary Islands, a portion of the West Coast of Africa, and St. Helena, extending his voyage as far as the Cape, where he will make preparations and inquiries for a projected expedition of discovery to be undertaken by him to the Antarctic regions. It will be remembered that the *Erebus* and *Terror*, commanded by Sir J. Ross and Capt. Crozier, penetrated in 1841 to 78° 4' S., a latitude which has never been reached before or since.

THE November number of *Petermann's Mittheilungen* has a long paper by Spiridon Gopčević, containing his ethnographical

studies in Upper Albania. A very fine map embodies the important results of Severzov's exploration of the Pamir in 1878, with accompanying text, followed by an account of Lieut.-Col. Pjevzov's journey through Mongolia in 1878-9, to Kuku-Choto and Kalgan. A summary is given of the Arctic work of 1880, followed by the usual monthly notes.

THE first *Bulletin* of the recently-formed International Geographical Institute at Berne consists of a programme of the projected Italian Antarctic Expedition under Lieut. Bone, which is to leave Genoa in March 1881. A sketch is given of what has been previously done in this region, showing that the field is practically virgin so far as scientific work is concerned. The programme of the Italian expedition is very comprehensive, and the ultimate object is to pave the way for the establishment of an Antarctic observing station.

No. 3 of vol. iii. of the *Deutsche geographische Blätter*, the organ of the Bremen Geographical Society, contains the continuation of the unfortunate Dr. Rutenberg's journal in Madagascar, and the lecture given at the Danzig meeting of the German Association by Dr. Neumayer on "Polar Expeditions or Polar Research?" To the latter able lecture we referred last week, the point insisted on being that while the two are perfectly congruous, the former should be subjected to the latter, which must be carried out on the system of Polar observatories advocated by Weyprecht, and to which nearly every civilised nation adheres except England.

THE new number of the Marseilles Geographical Society's *Bulletin* contains a very voluminous account by Messrs. Zweifel and Moustier, of their expedition to the sources of the Niger. This memoir is illustrated by a map showing their route, and supplemented by an appendix containing information as to the natural resources of the country traversed, the races of the interior, &c.

THE last part of *Le Globe* contains a paper (with map) on the Island of Cyprus, by M. Paul Chaix, and some account of recent researches in the Pamir, furnished by M. Veniukoff.

IN the current number of *Les Missions Catholiques*, M. Armbruster has commenced a series of papers on Corea, drawn from information furnished from time to time by the Romish missionaries, the only Europeans who have ever had any opportunity of acquiring a real knowledge of the interior.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—The preliminary examination in the Natural Science School begins on Monday next, November 29. The Final Honour School begins on Monday, December 6.

The Brakenbury Scholarship in Natural Science at Balliol College has been awarded to Mr. William Stroud, from Owens College, for proficiency in physics and chemistry. *Proxime accessit* Mr. A. D. Hall, from Manchester Grammar School. Mr. J. J. Hart, Manchester Grammar School, and Mr. J. E. Marsh of Balliol, are honourably mentioned.

ON A METHOD OF DETERMINING THE CRITICAL TEMPERATURE FOR ANY LIQUID AND ITS VAPOUR WITHOUT MECHANISM

A PIECE of straight glass tube—60 centimetres is a convenient length—is to be filled with the substance in a state of the greatest purity possible. It is to contain such a quantity of the substance that, at ordinary atmospheric temperatures, about 3 or 4 centimetres of the tube are occupied by steam of the substance, and the remainder liquid. Fix the tube in an upright position, with convenient appliances for warming the upper 10 centimetres of the length to the critical temperature, or to whatever higher or lower temperature may be desired; and for warming a length of 40 centimetres from the bottom to some lower temperature, and varying its temperature conveniently at pleasure.

Commence by warming the upper part until the surface of separation of liquid and steam sinks below 5 centimetres from the top. Then warm the lowest part until the surface rises

By Sir William Thomson, British Association, Swansea, Section A. Tuesday, August 31.